SM ENERGY

550 N. 31st Street, Ste. 500
P.O. Box 7168
Billings, MT 59101


May 20, 2014

NSR Program Manager/Attn: O&G Production Facilities
Wyoming Dept. of Environmental Quality
Air Quality Division
Herschler Bldg., 2-E
122 West 25th St
Cheyenne, WY 82002

Re: Permit Applications for Roger Leo Fed 3875-20-29-1FH and Spearhead Fed 14-7H

Dear Permitting Engineer:

SM Energy Company respectfully submits the following permit applications for the Roger Leo Fed and the Spearhead Fed. Both of the permit applications were submitted electronically and this envelope includes the additional paper copy with original signature.

Please contact us with any questions or concerns.

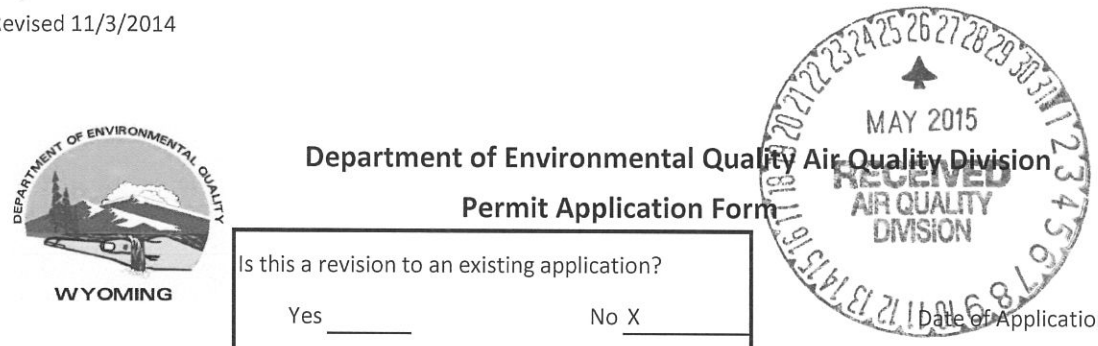
Respectfully,

Luke Studer

SM Energy Company

Reviewer HmB
cc:
Modeler
D.E.
File A0001145
IMP FID F026427
Spearhead

Revised 11/3/2014




WYOMING

## Department of Environmental Quality Air Quality Division

## Permit Application Form

Is this a revision to an existing application?

Yes _____ No X

Previous Application #:

Date of Application: 5/1/2015

## COMPANY INFORMATION:

Company Name: SM Energy Co.
Address: 550 North 31st Street Suite 500
City: Billings State: Montana Zip Code: 59103
Country: USA Phone Number: 4068698706

## FACILITY INFORMATION:

Facility Name: Spearhead Federal 14-7H
New Facility or Existing Facility: New
Facility Description: Oil and Gas Production Facility
Facility Class: Minor Operating Status: Operating
Facility Type: Production Site

***For Oil & Gas Production Sites ONLY:***
**First Date of Production (FDOP)/Date of Modification:** **March 2015**
**Does production at this facility contain H2S?*** No
***If yes, contact the Division.***
**API Number(s):** 49-009-29019

NAICS Code: 211111 Crude Petroleum and Natural Gas Extraction

## FACILITY LOCATION:

***Enter the facility location in either the latitude/longitude area or section/township/range area. Both are not required.**
Physical Address:
City: Zip Code:
State: WY County:

## OR

Latitude: 43.360414 Longitude: -105.789419 County: Converse
Quarter Quarter: SE Quarter: SW
Section: 7 Township: 39N Range: 74W

***For longitude and latitude, use NAD 83/WGS84 datum and 5 digits after the decimal (i.e. 41.12345, -107.56789)***

## CONTACT INFORMATION:

***Note that an Environmental AND NSR Permitting Contact is required for your application to be deemed complete by the agency.**
Title: Mr. First Name: Luke
Last Name: Studer
Company Name: SM Energy Co
Job Title: Regulatory & Safety Compliance Specialist
Address: 550 North 31st Street Suite 500
City: Billings State: Montana
Zip Code: 59103
Primary Phone No.: 406-869-8706 E-mail: lstuder@sm-energy.com
Mobile Phone No.: Fax No.:
Contact Type: Environmental contact Start Date:

Additional Contact Type (if needed): NSR Permitting contact

Title: Ms. First Name: Lynn

Last Name: Olson

Company Name: Trihydro Co

Job Title: Air Scientist

Address: 28769 Edward View Drive

City: Highland State: California

Zip Code: 92346

Primary Phone No.: (307) 633-9506 E-mail: lolson@trihydro.com

Mobile Phone No.: Fax No.:

Contact Type: NSR Permitting contact Start Date:

## FACILITY APPLICATION INFORMATION:

### General Info:

| | |
|---|---|
| Has the facility changed location or is it a new/ greenfield facility? | Yes |
| Has a Land Use Planning document been included in this application? | No |
| Is the facility located in a sage grouse core area?* | No |
| If the facility is in a sage grouse core area, what is the WER number? | |

** For questions about sage grouse core area, contact WY Game & Fish Department.*

### Federal Rules Applicability - Facility Level:

| | |
|---|---|
| Prevention of Significant Deterioration (PSD): | No |
| Non-Attainment New Source Review: | No |

### Modeling Section:

| | |
|---|---|
| Has the Air Quality Division been contacted to determine if modeling is required? | No |
| Is a modeling analysis part of this application? | No |
| Is the proposed project subject to Prevention of Significant Deterioration (PSD) requirements? | No |
| Has the Air Quality Division been notified to schedule a pre-application meeting? | No |
| Has a modeling protocol been submitted to and approved by the Air Quality Division? | No |
| Has the Air Quality Division received a Q/D analysis to submit to the respective FLMs to determine the need for an AQRV analysis? | No |

### Required Attachments:

| | |
|---|---|
| Facility Map | ☑ |
| Process Flow Diagram | ☐ |
| Modeling Analysis (if applicable) | ☐ |
| Land Use Planning Document | ☐ |
| Detailed Project Description | ☑ |
| Emissions Calculations | ☑ |

I, Luke Studer (Responsible Official (Printed Name)) Sr. EHS Specialist (Title)

an Official Representative of the Company, state that I have knowledge of the facts herein set forth and that the same are true and correct to the best of my knowledge and belief. I further certify that the operational information provided and emission rates listed on this application reflect the anticipated emissions due to the operation of this facility. The facility will operate in compliance with all applicable Wyoming Air Quality Standards and Regulations.

Signature: (ink) Date: 5-19-15

Company Name: SM Energy

Facility Name: Spearhead Federal 14-7H

## Process Description

The Spearhead Federal 14-7H well has a plunger lift. A rotaflex pump and a generator (previously permitted: P0005290) run the pumping unit and facility.

The fluid stream containing natural gas, crude oil and produced water is routed to the vertical treater. The treater has a 0.75 MMBtu/hr heater. Three streams are generated in the treater including gas, oil, and water.

The crude oil stream is sent to one of the six oil tanks. The tank vapor emissions are captured and sent to the low pressure tip of the Steffes flare (on-site). The combustion efficiency is estimated at 98 percent. The crude oil is hauled offsite by tank trucks.

The gas phase stream leaves the separator and is sent offsite to a pipeline owned by a third party. The stream is also used to fuel the vertical treaters burner if additional fuel is needed. If the gas cannot be sent to the sales line, it will be sent to the high pressure tip of the Steffes flare (considered an emergency situation).

The water is sent to two 400-barrel aboveground storage tanks and sent off site by truck. Since little water is produced and the water is from a treated stream, emissions are assumed to be minimal.

Fugitive emissions are associated with the valves, gauges, tank vents, hatches and connectors at the site. The components were estimated based on similar facilities . An exact component count was not performed.

**STATE OF WYOMING**

Department of Environmental Quality - Air Quality Division

Oil and Gas Production Facilities C6 S2 Permit Application

## Equipment List

Company Name: SM Energy

Facility Name: Spearhead Federal 14-7H

List all production equipment at the site including all pressurized vessels with the potential for flash emissions, all hydrocarbon liquids and produced water storage tanks, all dehydration units, all pneumatic pumps, all natural gas-fired burners and heaters and all emission control equipment and devices. Pressurized vessels with the potential for flash emissions are all vessels that vent vapors to the atmosphere during times other than upset or emergency conditions (water knockouts, 2-phase and 3-phase separators, heater treaters, gun barrels, scrubber pots, etc). Provide design ratings for dehys (MMCFD), process heaters, burners and pilots (MMBtu/hr, SCFH). Provide size of production & water storage tanks (BPD). For dehydration units indicate if the unit includes a glycol flash separator and/or reboiler still vent condenser. For emission control combustors/flares indicate design rating (MMBtu/hr, SCFD) and combustor/flare height (ft). Provide pneumatic pump motive gas usage (SCFH).

**2 400-bbl water tank**

**6 400-bbl oil tanks (controlled by combustor)**

**1 6' x 20' vertical treater with 0.75 MMBtu heater**

**1 rotaflex pump with associated generator (already permitted: P0005290)**

**1 Steffes combination flare with a low pressure tip for tank vapors and higher pressure for emergencies when produced gas cannot go to sales line**

Revised 11/3/2014

**Specific Emission Unit Attributes:**

# Heater/Chiller

Company Equipment ID: Spearhead Federal Heater Treater heater
Company Equipment Description: Heater Treater heater

Operating Status: Operating
Initial Construction Commencement Date: Oct 2014 - Feb 2015
Initial Operation Commencement Date: Mar-15
Most Recent Construction/ Modification Commencement Date: NA

Most Recent Operation Commencement Date: NA

**Select reason(s) for this emissions unit being included in this application (must be completed regardless of date of installation or modification):**

Reason: Construction (Greenfield/New Facility)

If reason is ***Reconstruction*** or ***Temporary Permit*** or ***Other,*** please explain below:

Firing Type: Direct
Heat Input Rating: 0.75 Units: MMBtu/hr
Primary Fuel Type: Field Gas
Secondary Fuel Type:
Heat Content of Fuel: 1379 Units: BTU/scf
Fuel Sulfur Content: 0 Units: ppm

**SCC Codes:** List all Source Classification Code(s) (SCC) that describe the process(es) performed by the emission source (e.g., 1-02-002-04).

2310010100

**Potential Operating Schedule:** Provide the operating schedule for this emission unit.

Hours/day: 24
Hours/year: 8760

**Control Equipment:** No

***If yes, please fill out and attach the appropriate Control Device and Release Point Information worksheets.***

**Best Available Control Technology (BACT):** Was a BACT Analysis completed for this emission unit?

Yes No X

Pollutant: _____

Proposed BACT: _____

*If yes, attach BACT Analysis with this application.

**Lowest Achievable Emission Rate (LAER):** Was a LAER Analysis completed for this emission unit?

Yes No X

Pollutant: _____

Proposed LAER: _____

*If yes, attach LAER Analysis with this application.

**Federal and State Rule Applicability:**

New Source Performance Standards (NSPS): Not Affected

*New Source Performance Standard are listed under 40 CFR 60- Standards of Performance for New Stationary Sources.*

NSPS Subpart: _____

National Emission Standards for Hazardous Air Pollutants (NESHAP Part 61): Not Affected

*National Emissions Standards for Hazardous Air Pollutants (NESHAP Part 61) are listed under 40 CFR 61. (These include asbestos, benzene, beryllium, mercury, and vinyl chloride).*

Part 61 NESHAP Subpart: _____

National Emission Standards for Hazardous Air Pollutants (NESHAP Part 63): Not Affected

*National Emission Standards for Hazardous Air Pollutants (NESHAP Part 63) standards are listed under 40 CFR 63*

Part 63 NESHAP Subpart: _____

Prevention of Significant Deterioration (PSD): Not Affected

*These rules are found under WAQSR Chapter 6, Section 4.*

Non-Attainment New Source Review: Not Affected

*These rules are found under WAQSR Chapter 6, Section 13.*

**Emissions Information-** The following tables request information needed to determine the applicable requirements and the compliance status of this emission unit with those requirements.

| | | | Efficiency Standards | | | | |
|---|---|---|---|---|---|---|---|
| | | Pre-Controlled Potential Emissions (tons/yr) | Potential to Emit (PTE) | Units | Potential to Emit (lbs/hr) | Potential to Emit (tons/yr) | Basis for Determination |
| **Criteria Pollutants:** | | | | | | | |
| 1.) | Particulate emissions (PE/PM) (formerly particulate matter, PM) | | | | | | |
| 2.) | PM #10 microns in diameter (PE/PM10) | | | | | | |
| 3.) | PM #2.5 microns in diameter (PE/PM2.5) | | | | | | |
| 4.) | Sulfur dioxide (SO2) | | | | | | |
| 5.) | Nitrogen Oxides (NOx) | | 0.10 | lb/MMBtu | 0.07 | 0.32 | AP-42 |
| 6.) | Carbon monoxide (CO) | | 0.08 | lb/MMBtu | 0.06 | 0.27 | AP-42 |
| 7.) | Volatile organic compounds (VOC) | | 0.01 | lb/MMBtu | 0.00 | 0.02 | AP-42 |
| 8.) | Lead (Pb) | | | | | | |
| 9.) | Total Hazardous Air Pollutants (HAPs) | | See attached | | 0.00 | 0.01 | AP-42 |
| 10.) | Fluoride (F) | | | | | | |
| 11.) | Hydrogen Sulfide (H2S) | | | | | | |
| 12.) | Mercury (Hg) | | | | | | |
| 13.) | Total Reduced Sulfur (TRS) | | | | | | |
| 14.) | Sulfuric Acid Mist (SAM) | | | | | | |

***Provide your calculations as an attachment and explain how all process variables and emissions factors were selected.***

## Hazardous Air Pollutants (HAPs) and Toxic Air Contaminants

| Pollutants: | | Pre-Controlled Potential Emissions (tons/yr) | Efficiency Standards: Potential to Emit (PTE) | Efficiency Standards: Units | Potential to Emit (lbs/hr) | Potential to Emit (tons/yr) | Basis for Determination |
|---|---|---|---|---|---|---|---|
| 1.) | See Attached | | | | | | |
| 2.) | | | | | | | |
| 3.) | | | | | | | |
| 4.) | | | | | | | |
| 5.) | | | | | | | |
| 6.) | | | | | | | |
| 7.) | | | | | | | |
| 8.) | | | | | | | |

## Greenhouse Gases (GHGs)

| Pollutants: | | Pre-Controlled Potential Emissions (tons/yr) | Efficiency Standards: Potential to Emit (PTE) | Efficiency Standards: Units | Potential to Emit (lbs/hr) | Potential to Emit (tons/yr) | Basis for Determination |
|---|---|---|---|---|---|---|---|
| 1.) | | | | | | | |
| 2.) | | | | | | | |
| 3.) | | | | | | | |
| 4.) | | | | | | | |
| 5.) | | | | | | | |
| 6.) | | | | | | | |
| 7.) | | | | | | | |
| 8.) | | | | | | | |

Revised 11/3/2014

**Specific Emission Unit Attributes:**

# Separator/Treater

Company Equipment ID: Sprearhead Fed Heater Treater
Company Equipment Description: Heater Treater

Operating Status: Operating
Initial Construction Commencement Date: Oct 2014 - Feb 2015
Initial Operation Commencement Date: Mar-15
Most Recent Construction/ Modification Commencement Date: NA

Most Recent Operation Commencement Date: NA

**Select reason(s) for this emissions unit being included in this application (must be completed regardless of date of installation or modification):**

Reason: Construction (Greenfield/New Facility)

If reason is ***Reconstruction*** or ***Temporary Permit*** or ***Other,*** please explain below:

Type of Vessel: Heater-Treater  Is Vessel Heated? Yes
Operating Temperature (F): 80-145
Operating Pressure (psig): 25-75

**SCC Codes:** List all Source Classification Code(s) (SCC) that describe the process(es) performed by the emission source (e.g., 1-02-002-04).

31000129

**Potential Operating Schedule:** Provide the operating schedule for this emission unit.
Hours/day: 24
Hours/year: 8760

**Control Equipment:** Yes

***If yes, please fill out and attach the appropriate Control Device and Release Point Information worksheets.***

**Best Available Control Technology (BACT):** Was a BACT Analysis completed for this emission unit?

Yes No X

Pollutant: _____

Proposed BACT: Presumptive BACT- Smokeless Combustor 98% control, but all gas is typically sold

*If yes, attach BACT Analysis with this application.

**Lowest Achievable Emission Rate (LAER):** Was a LAER Analysis completed for this emission unit?

Yes No X

Pollutant: _____

Proposed LAER: _____

*If yes, attach LAER Analysis with this application.

**Federal and State Rule Applicability:**

New Source Performance Standards (NSPS): Not Affected

*New Source Performance Standard are listed under 40 CFR 60- Standards of Performance for New Stationary Sources.*

NSPS Subpart: _____

National Emission Standards for Hazardous Air Pollutants (NESHAP Part 61): Not Affected

*National Emissions Standards for Hazardous Air Pollutants (NESHAP Part 61) are listed under 40 CFR 61. (These include asbestos, benzene, beryllium, mercury, and vinyl chloride).*

Part 61 NESHAP Subpart: _____

National Emission Standards for Hazardous Air Pollutants (NESHAP Part 63): Not Affected

*National Emission Standards for Hazardous Air Pollutants (NESHAP Part 63) standards are listed under 40 CFR 63*

Part 63 NESHAP Subpart: _____

Prevention of Significant Deterioration (PSD): Not Affected

*These rules are found under WAQSR Chapter 6, Section 4.*

Non-Attainment New Source Review: Not Affected

*These rules are found under WAQSR Chapter 6, Section 13.*

Revised 11/3/2014

**Specific Emission Unit Attributes:**

# Storage Tank/Silo

Company Equipment ID: Spearhead Fed Crude Oil Tanks 1-6
Company Equipment Description: Crude Tanks 1-6

Operating Status: Operating
Initial Construction Commencement Date: Oct 2014 - Feb 2015
Initial Operation Commencement Date: Mar-15
Most Recent Construction/ Modification Commencement Date: NA

Most Recent Operation Commencement Date: NA

**Select reason(s) for this emissions unit being included in this application (must be completed regardless of date of installation or modification):**

Reason: Construction (Greenfield/New Facility)

If reason is ***Reconstruction*** or ***Temporary Permit*** or ***Other,*** please explain below:

Material Type: Liquid
Description of Material Stored: Crude Oil from Oil well production

Capacity: 400 Units: barrels
Maximum Throughput: 235 Units: barrels/day
Maximum Hourly Throughput: 19.6 Units:
Operating Pressure (psig): Atmosphere
Vapor Pressure of Material Stored (psig): RVP 8
Is Tank Heated?: No

**SCC Codes:** List all Source Classification Code(s) (SCC) that describe the process(es) performed by the emission source (e.g., 1-02-002-04).

2310010200

**Potential Operating Schedule:** Provide the operating schedule for this emission unit.

Hours/day: 24
Hours/year: 8760

**Control Equipment:** Yes

***If yes, please fill out and attach the appropriate Control Device and Release Point Information worksheets.***

**Best Available Control Technology (BACT):** Was a BACT Analysis completed for this emission unit?

Yes ☐ No ☑

Pollutant: _____

Proposed BACT: Presumptive BACT- Smokeless Combustor 98% control

*If yes, attach BACT Analysis with this application.

**Lowest Achievable Emission Rate (LAER):** Was a LAER Analysis completed for this emission unit?

Yes ☐ No ☑

Pollutant: _____

Proposed LAER: _____

*If yes, attach LAER Analysis with this application.

**Federal and State Rule Applicability:**

New Source Performance Standards (NSPS): Not Affected

*New Source Performance Standard are listed under 40 CFR 60- Standards of Performance for New Stationary Sources.*

NSPS Subpart: _____

National Emission Standards for Hazardous Air Pollutants (NESHAP Part 61): Not Affected

*National Emissions Standards for Hazardous Air Pollutants (NESHAP Part 61) are listed under 40 CFR 61. (These include asbestos, benzene, beryllium, mercury, and vinyl chloride).*

Part 61 NESHAP Subpart: _____

National Emission Standards for Hazardous Air Pollutants (NESHAP Part 63): Not Affected

*National Emission Standards for Hazardous Air Pollutants (NESHAP Part 63) standards are listed under 40 CFR 63*

Part 63 NESHAP Subpart: _____

Prevention of Significant Deterioration (PSD): Not Affected

*These rules are found under WAQSR Chapter 6, Section 4.*

Non-Attainment New Source Review: Not Affected

*These rules are found under WAQSR Chapter 6, Section 13.*

Revised 11/3/2014

**Specific Emission Unit Attributes:**

# Storage Tank/Silo

Company Equipment ID: Sprearhead Fed Produced Water Tanks
Company Equipment Description: Produced Water 1, Produced Water 2

Operating Status: Operating
Initial Construction Commencement Date: Oct 2014 - Feb 2015
Initial Operation Commencement Date: Mar-15
Most Recent Construction/ Modification Commencement Date: NA

Most Recent Operation Commencement Date: NA

**Select reason(s) for this emissions unit being included in this application (must be completed regardless of date of installation or modification):**

Reason: Construction (Greenfield/New Facility)

If reason is ***Reconstruction*** or ***Temporary Permit*** or ***Other,*** please explain below:

Material Type: Liquid
Description of Material Stored: Produced water from oil well production

Capacity: 400 Units: barrels
Maximum Throughput: 145 Units: barrels/day
Maximum Hourly Throughput: 12 Units:
Operating Pressure (psig): Atmosphere
Vapor Pressure of Material Stored (psig): 1 (water)
Is Tank Heated?: No

**SCC Codes:** List all Source Classification Code(s) (SCC) that describe the process(es) performed by the emission source (e.g., 1-02-002-04).

2310010200

**Potential Operating Schedule:** Provide the operating schedule for this emission unit.
Hours/day: 24
Hours/year: 8760

**Control Equipment:** Yes

***If yes, please fill out and attach the appropriate Control Device and Release Point Information worksheets.***

**Best Available Control Technology (BACT):** Was a BACT Analysis completed for this emission unit?

Yes ☐ No ☑

Pollutant: _____

Proposed BACT: _____

*If yes, attach BACT Analysis with this application.

**Lowest Achievable Emission Rate (LAER):** Was a LAER Analysis completed for this emission unit?

Yes ☐ No ☑

Pollutant: _____

Proposed LAER: _____

*If yes, attach LAER Analysis with this application.

**Federal and State Rule Applicability:**

New Source Performance Standards (NSPS): Not Affected

*New Source Performance Standard are listed under 40 CFR 60- Standards of Performance for New Stationary Sources.*

NSPS Subpart: _____

National Emission Standards for Hazardous Air Pollutants (NESHAP Part 61): Not Affected

*National Emissions Standards for Hazardous Air Pollutants (NESHAP Part 61) are listed under 40 CFR 61. (These include asbestos, benzene, beryllium, mercury, and vinyl chloride).*

Part 61 NESHAP Subpart: _____

National Emission Standards for Hazardous Air Pollutants (NESHAP Part 63): Not Affected

*National Emission Standards for Hazardous Air Pollutants (NESHAP Part 63) standards are listed under 40 CFR 63*

Part 63 NESHAP Subpart: _____

Prevention of Significant Deterioration (PSD): Not Affected

*These rules are found under WAQSR Chapter 6, Section 4.*

Non-Attainment New Source Review: Not Affected

*These rules are found under WAQSR Chapter 6, Section 13.*

Revised 11/3/2014

**Control Equipment:**

# Flare/Combustor

| | | | |
|---|---|---|---|
| Manufacturer: | Steffes | Date Installed: | Oct 2014 - Feb 2015 |
| Model Name and Number: | Dual Tip (low and high pressure) | Company Control Equipment ID: | |
| Company Control Equipment Description: | Spearhead Federal tank vapor and emergency gas flare | | Spearhead Fed Flare |

| Pollutant(s) Controlled: | CO | NOx | Pb | SO2 | ☑ VOC | PM | |
|---|---|---|---|---|---|---|---|
| PM (FIL) | PM Condensable | PM 10 (FIL) | | PM 2.5 (FIL) | | PM 10 | PM 2.5 |
| Other HAPs | ☑ | | | | | | |

**NOTE: The following fields require numeric values unless otherwise denoted with an asterisk***

| | | | |
|---|---|---|---|
| Maximum Design Capacity (MMSCF/hr): | High pressure tip 1.1, low 0.006 MMscf/hr | | |
| Minimum Design Capacity (MMSCF/hr): | High pressure tip 0.0011, low 4.4 scf/hr | | |
| Design Control Efficiency (%): | 98 | Capture Efficiency (%): | |
| Operating Control Efficiency (%): | 98 | | |
| **Flare Type:*** | Elevated- Open | **Elevated Flare Type:*** | Non-Assisted |
| **Ignition Device:*** | Yes | **Flame Presence Sensor:*** | Yes |
| Inlet Gas Temp (F): | ambient at 90F | **Flame Presence Type:*** | Other |
| Gas ☑ ow Rate (acfm): | varies | Outlet Gas Temp (F): | 900 |

This is the only control equipment on this air contaminant source

If not, this control equipment is: Primary ☑ Secondary ☐ Parallel ☐

**List all other emission units that are also vented to this control equipment:***

This Flare contols tank vapors, and in emergency situations when associated gas can not be sold (or consumed by the treater heater).

**List all release point IDs associated with this control equipment:***

Tanks & Heater Treater (in emergencies)

**Emissions Information-** The following tables request information needed to determine the applicable requirements and the compliance status of this emission unit with those requirements.

| | | | Efficiency Standards | | | | |
|---|---|---|---|---|---|---|---|
| | | Pre-Controlled Potential Emissions (tons/yr) | Potential to Emit (PTE) | Units | Potential to Emit (lbs/hr) | Potential to Emit (tons/yr) | Basis for Determination |
| **Criteria Pollutants:** | | | | | | | |
| 1.) | Particulate emissions (PE/PM) (formerly particulate matter, PM) | | | | | | |
| 2.) | PM #10 microns in diameter (PE/PM10) | | | | | | |
| 3.) | PM #2.5 microns in diameter (PE/PM2.5) | | | | | | |
| 4.) | Sulfur dioxide (SO2) | | | | | | |
| 5.) | Nitrogen Oxides (NOx) | | 0.14 | lb/MMBtu | 0.29 | 1.258936 | AP-42 |
| 6.) | Carbon monoxide (CO) | | 0.37 | lb/MMBtu | 0.76 | 3.327189 | AP-42 |
| 7.) | Volatile organic compounds (VOC) | 372.18 | | | 1.70 | 7.44352 | Tanks Program |
| 8.) | Lead (Pb) | | | | | | |
| 9.) | Total Hazardous Air Pollutants (HAPs) | 7.72 | | | 0.04 | 0.1544 | Tanks Program |
| 10.) | Fluoride (F) | | | | | | |
| 11.) | Hydrogen Sulfide (H2S) | | | | | | |
| 12.) | Mercury (Hg) | | | | | | |
| 13.) | Total Reduced Sulfur (TRS) | | | | | | |
| 14.) | Sulfuric Acid Mist (SAM) | | | | | | |

***Provide your calculations as an attachment and explain how all process variables and emissions factors were selected.***

## Hazardous Air Pollutants (HAPs) and Toxic Air Contaminants

| Pollutants: | | Pre-Controlled Potential Emissions (tons/yr) | Efficiency Standards: Potential to Emit (PTE) | Efficiency Standards: Units | Potential to Emit (lbs/hr) | Potential to Emit (tons/yr) | Basis for Determination |
|---|---|---|---|---|---|---|---|
| 1.) | See Attached | | | | | | |
| 2.) | | | | | | | |
| 3.) | | | | | | | |
| 4.) | | | | | | | |
| 5.) | | | | | | | |
| 6.) | | | | | | | |
| 7.) | | | | | | | |
| 8.) | | | | | | | |

## Greenhouse Gases (GHGs)

| Pollutants: | | Pre-Controlled Potential Emissions (tons/yr) | Efficiency Standards: Potential to Emit (PTE) | Efficiency Standards: Units | Potential to Emit (lbs/hr) | Potential to Emit (tons/yr) | Basis for Determination |
|---|---|---|---|---|---|---|---|
| 1.) | | | | | | | |
| 2.) | | | | | | | |
| 3.) | | | | | | | |
| 4.) | | | | | | | |
| 5.) | | | | | | | |
| 6.) | | | | | | | |
| 7.) | | | | | | | |
| 8.) | | | | | | | |

**Specific Emission Unit Attributes:**

# Fugitives

Company Equipment ID: Spearhead Fed Fugs
Company Equipment Description: Fugitive Emissions

Operating Status: Operating
Initial Construction Commencement Date: Oct 2014 - Feb 2015
Initial Operation Commencement Date: Mar-15
Most Recent Construction/ Modification Commencement Date: NA

Most Recent Operation Commencement Date: NA

**Select reason(s) for this emissions unit being included in this application (must be completed regardless of date of installation or modification):**

Reason: Construction (Greenfield/New Facility)

If reason is ***Reconstruction*** or ***Temporary Permit*** or ***Other,*** please explain below:

Type of Fugitive Emission: Fugitive Leaks at O&G

**SCC Codes:** List all Source Classification Code(s) (SCC) that describe the process(es) performed by the emission source (e.g., 1-02-002-04).

31088811

**Potential Operating Schedule:** Provide the operating schedule for this emission unit.

Hours/day: 24
Hours/year: 8760

**Control Equipment:** No

***If yes, please fill out and attach the appropriate Control Device and Release Point Information worksheets.***

**Best Available Control Technology (BACT):** Was a BACT Analysis completed for this emission unit?

Yes ☐ No ☑

Pollutant: _____

Proposed BACT: _____

*If yes, attach BACT Analysis with this application.

**Lowest Achievable Emission Rate (LAER):** Was a LAER Analysis completed for this emission unit?

Yes ☐ No ☑

Pollutant: _____

Proposed LAER: _____

*If yes, attach LAER Analysis with this application.

**Federal and State Rule Applicability:**

New Source Performance Standards (NSPS): Not Affected

*New Source Performance Standard are listed under 40 CFR 60- Standards of Performance for New Stationary Sources.*

NSPS Subpart: _____

National Emission Standards for Hazardous Air Pollutants (NESHAP Part 61): Not Affected

*National Emissions Standards for Hazardous Air Pollutants (NESHAP Part 61) are listed under 40 CFR 61. (These include asbestos, benzene, beryllium, mercury, and vinyl chloride).*

Part 61 NESHAP Subpart: _____

National Emission Standards for Hazardous Air Pollutants (NESHAP Part 63): Not Affected

*National Emission Standards for Hazardous Air Pollutants (NESHAP Part 63) standards are listed under 40 CFR 63*

Part 63 NESHAP Subpart: _____

Prevention of Significant Deterioration (PSD): Not Affected

*These rules are found under WAQSR Chapter 6, Section 4.*

Non-Attainment New Source Review: Not Affected

*These rules are found under WAQSR Chapter 6, Section 13.*

**Emissions Information-** The following tables request information needed to determine the applicable requirements and the compliance status of this emission unit with those requirements.

| | | | Efficiency Standards | | | | |
|---|---|---|---|---|---|---|---|
| | | Pre-Controlled Potential Emissions (tons/yr) | Potential to Emit (PTE) | Units | Potential to Emit (lbs/hr) | Potential to Emit (tons/yr) | Basis for Determination |
| **Criteria Pollutants:** | | | | | | | |
| 1.) | Particulate emissions (PE/PM) (formerly particulate matter, PM) | | | | | | |
| 2.) | PM #10 microns in diameter (PE/PM10) | | | | | | |
| 3.) | PM #2.5 microns in diameter (PE/PM2.5) | | | | | | |
| 4.) | Sulfur dioxide (SO2) | | | | | | |
| 5.) | Nitrogen Oxides (NOx) | | | | | | |
| 6.) | Carbon monoxide (CO) | | | | | | |
| 7.) | Volatile organic compounds (VOC) | | | | 0.83 | 3.64 | Other |
| 8.) | Lead (Pb) | | | | | | |
| 9.) | Total Hazardous Air Pollutants (HAPs) | | | | 0.07 | 0.30 | Other |
| 10.) | Fluoride (F) | | | | | | |
| 11.) | Hydrogen Sulfide (H2S) | | | | | | |
| 12.) | Mercury (Hg) | | | | | | |
| 13.) | Total Reduced Sulfur (TRS) | | | | | | |
| 14.) | Sulfuric Acid Mist (SAM) | | | | | | |

***Provide your calculations as an attachment and explain how all process variables and emissions factors were selected.***

## Hazardous Air Pollutants (HAPs) and Toxic Air Contaminants

| Pollutants: | | Pre-Controlled Potential Emissions (tons/yr) | Efficiency Standards: Potential to Emit (PTE) | Efficiency Standards: Units | Potential to Emit (lbs/hr) | Potential to Emit (tons/yr) | Basis for Determination |
|---|---|---|---|---|---|---|---|
| 1.) | NA | | | | | | |
| 2.) | | | | | | | |
| 3.) | | | | | | | |
| 4.) | | | | | | | |
| 5.) | | | | | | | |
| 6.) | | | | | | | |
| 7.) | | | | | | | |
| 8.) | | | | | | | |

## Greenhouse Gases (GHGs)

| Pollutants: | | Pre-Controlled Potential Emissions (tons/yr) | Efficiency Standards: Potential to Emit (PTE) | Efficiency Standards: Units | Potential to Emit (lbs/hr) | Potential to Emit (tons/yr) | Basis for Determination |
|---|---|---|---|---|---|---|---|
| 1.) | NA | | | | | | |
| 2.) | | | | | | | |
| 3.) | | | | | | | |
| 4.) | | | | | | | |
| 5.) | | | | | | | |
| 6.) | | | | | | | |
| 7.) | | | | | | | |
| 8.) | | | | | | | |

Revised 11/3/2014

**Specific Emission Unit Attributes:**

# Loading/Unloading/Dump

Company Equipment ID: Spearhead Fed Truck Loading
Company Equipment Description: Loading

Operating Status: Operating
Initial Construction Commencement Date: Oct 2014 - Feb 2015
Initial Operation Commencement Date: Mar-15
Most Recent Construction/ Modification Commencement Date: NA

Most Recent Operation Commencement Date: NA

**Select reason(s) for this emissions unit being included in this application (must be completed regardless of date of installation or modification):**

Reason: Construction (Greenfield/New Facility)

If reason is ***Reconstruction*** or ***Temporary Permit*** or ***Other,*** please explain below:

Type of Material: Liquid
Material Description: Crude Oil and Produced Water

Maximum Annual Throughput: 95300 Units: barrels/yr
Maximum Hourly Throughput: 85 Units: barrels/hr
Detailed Description of Loading/Unloading/Dump Source:
Crude Oil and Produced water from oil well

**SCC Codes:** List all Source Classification Code(s) (SCC) that describe the process(es) performed by the emission source (e.g., 1-02-002-04).

2310010800

**Potential Operating Schedule:** Provide the operating schedule for this emission unit.
Hours/day: 4
Hours/year: 1460

**Control Equipment:** No

***If yes, please fill out and attach the appropriate Control Device and Release Point Information worksheets.***

**Best Available Control Technology (BACT):** Was a BACT Analysis completed for this emission unit?

Yes ☐ No ☑

Pollutant: _____

Proposed BACT: _____

*If yes, attach BACT Analysis with this application.

**Lowest Achievable Emission Rate (LAER):** Was a LAER Analysis completed for this emission unit?

Yes ☐ No ☑

Pollutant: _____

Proposed LAER: _____

*If yes, attach LAER Analysis with this application.

**Federal and State Rule Applicability:**

New Source Performance Standards (NSPS): Not Affected

*New Source Performance Standard are listed under 40 CFR 60- Standards of Performance for New Stationary Sources.*

NSPS Subpart: _____

National Emission Standards for Hazardous Air Pollutants (NESHAP Part 61): Not Affected

*National Emissions Standards for Hazardous Air Pollutants (NESHAP Part 61) are listed under 40 CFR 61. (These include asbestos, benzene, beryllium, mercury, and vinyl chloride).*

Part 61 NESHAP Subpart: _____

National Emission Standards for Hazardous Air Pollutants (NESHAP Part 63): Not Affected

*National Emission Standards for Hazardous Air Pollutants (NESHAP Part 63) standards are listed under 40 CFR 63*

Part 63 NESHAP Subpart: _____

Prevention of Significant Deterioration (PSD): Not Affected

*These rules are found under WAQSR Chapter 6, Section 4.*

Non-Attainment New Source Review: Not Affected

*These rules are found under WAQSR Chapter 6, Section 13.*

**Emissions Information-** The following tables request information needed to determine the applicable requirements and the compliance status of this emission unit with those requirements.

| | | | Efficiency Standards | | | | |
|---|---|---|---|---|---|---|---|
| | | Pre-Controlled Potential Emissions (tons/yr) | Potential to Emit (PTE) | Units | Potential to Emit (lbs/hr) | Potential to Emit (tons/yr) | Basis for Determination |
| **Criteria Pollutants:** | | | | | | | |
| 1.) | Particulate emissions (PE/PM) (formerly particulate matter, PM) | | | | | | |
| 2.) | PM #10 microns in diameter (PE/PM10) | | | | | | |
| 3.) | PM #2.5 microns in diameter (PE/PM2.5) | | | | | | |
| 4.) | Sulfur dioxide (SO2) | | | | | | |
| 5.) | Nitrogen Oxides (NOx) | | | | | | |
| 6.) | Carbon monoxide (CO) | | | | | | |
| 7.) | Volatile organic compounds (VOC) | | 1.366** | | 3.37 | 2.46 | AP-42 |
| 8.) | Lead (Pb) | | | | | | |
| 9.) | Total Hazardous Air Pollutants (HAPs) | | | | 0.28 | 0.20 | AP-42 |
| 10.) | Fluoride (F) | | | | | | |
| 11.) | Hydrogen Sulfide (H2S) | | | | | | |
| 12.) | Mercury (Hg) | | | | | | |
| 13.) | Total Reduced Sulfur (TRS) | | | | | | |
| 14.) | Sulfuric Acid Mist (SAM) | | | | | | |

***Provide your calculations as an attachment and explain how all process variables and emissions factors were selected.***

** lb/1000 gallons, uncontrolled PTE based on operating 8760 hours

## Hazardous Air Pollutants (HAPs) and Toxic Air Contaminants

| Pollutants: | | Pre-Controlled Potential Emissions (tons/yr) | Efficiency Standards: Potential to Emit (PTE) | Efficiency Standards: Units | Potential to Emit (lbs/hr) | Potential to Emit (tons/yr) | Basis for Determination |
|---|---|---|---|---|---|---|---|
| 1.) | NA | | | | | | |
| 2.) | | | | | | | |
| 3.) | | | | | | | |
| 4.) | | | | | | | |
| 5.) | | | | | | | |
| 6.) | | | | | | | |
| 7.) | | | | | | | |
| 8.) | | | | | | | |

## Greenhouse Gases (GHGs)

| Pollutants: | | Pre-Controlled Potential Emissions (tons/yr) | Efficiency Standards: Potential to Emit (PTE) | Efficiency Standards: Units | Potential to Emit (lbs/hr) | Potential to Emit (tons/yr) | Basis for Determination |
|---|---|---|---|---|---|---|---|
| 1.) | NA | | | | | | |
| 2.) | | | | | | | |
| 3.) | | | | | | | |
| 4.) | | | | | | | |
| 5.) | | | | | | | |
| 6.) | | | | | | | |
| 7.) | | | | | | | |
| 8.) | | | | | | | |

Revised 11/3/2014

**Release Point Information:**

Complete the table below for ***each*** release point. Please include release point information for each emission unit. Multiple attachments may be necessary. A release point is a point at which emissions from an emission unit are released into the ambient (outside)air. List each individual release point on a separate pair of lines (release point ID and description). ***For longitude and latitude, use NAD 83/WGS84 datum and 5 digits after the decimal (i.e. 41.12345, -107.56789)***

| Stack Release Point Information | | |
|---|---|---|
| Company Release Point ID: | Release Point Type: | Vertical |
| Controlled Tank & Emergency gas Emissions | Release Point Latitude: | 43.360414 |
| | Release Point Longitude: | -105.789419 |
| Company Release Point Description: | Base Elevation (ft): | 5198 |
| Tank vapor and Associated gas combustor emissions | Stack Height (ft): | 20 |
| | Stack Diameter (ft): | 0.25 |
| | Exit Gas Velocity (ft/s): | 300 |
| | Exit Gas Temp (F): | 900 |
| | Exit Gas Flow Rate (acfm): | 1178 |
| Company Release Point ID: | Release Point Type: | Vertical |
| Heater Treater heater | Release Point Latitude: | 43.360414 |
| | Release Point Longitude: | -105.789419 |
| Company Release Point Description: | Base Elevation (ft): | 5198 |
| | Stack Height (ft): | 20 |
| | Stack Diameter (ft): | 1 |
| | Exit Gas Velocity (ft/s): | 7.2 |
| | Exit Gas Temp (F): | 575 |
| | Exit Gas Flow Rate (acfm): | 340 |
| Company Release Point ID: | Release Point Type: | |
| | Release Point Latitude: | |
| | Release Point Longitude: | |
| Company Release Point Description: | Base Elevation (ft): | |
| | Stack Height (ft): | |
| | Stack Diameter (ft): | |
| | Exit Gas Velocity (ft/s): | |
| | Exit Gas Temp (F): | |
| | Exit Gas Flow Rate (acfm): | |
| Company Release Point ID: | Release Point Type: | |
| | Release Point Latitude: | |
| | Release Point Longitude: | |
| Company Release Point Description: | Base Elevation (ft): | |
| | Stack Height (ft): | |
| | Stack Diameter (ft): | |
| | Exit Gas Velocity (ft/s): | |
| | Exit Gas Temp (F): | |
| | Exit Gas Flow Rate (acfm): | |

Revised 11/3/2014

Complete the table below for each fugitive (area, volume, line) release point. List each individual release point on a separate line.

| Fugitive Release Point Information | |
|---|---|
| Company Release Point ID:<br>Fugs<br>Company Release Point Description:<br>Fugitives, which by definition do not have a point, volume or line | Release Point Latitude: 43.360414<br>Release Point Longitude: -105.789419<br>Release Height (ft): between 1 and 30 |
| Company Release Point ID:<br><br>Company Release Point Description:<br> | Release Point Latitude:<br>Release Point Longitude:<br>Release Height (ft): |
| Company Release Point ID:<br><br>Company Release Point Description:<br> | Release Point Latitude:<br>Release Point Longitude:<br>Release Height (ft): |
| Company Release Point ID:<br><br>Company Release Point Description:<br> | Release Point Latitude:<br>Release Point Longitude:<br>Release Height (ft): |

**SM ENERGY**
**Spearhead Federal 14-7H**
**COMBUSTION EMISSIONS**

| Compound | Emission Factor ($lb/10^6 ft^3$) | Emission Factor (lb/MMBtu) | Treaters - 0.75 MMBtu/hr PTE (TPY) | Emission Factor Source |
|---|---|---|---|---|
| CO | 84 | 0.082352941 | 0.271 | AP-42 Table 1.4-1 |
| $NO_x$ | 100 | 0.098039216 | 0.322 | AP-42 Table 1.4-1 |
| $SO_2$ | 0.6 | 0.000588235 | 0.002 | AP-42 Table 1.4-2 |
| VOC | 5.5 | 0.005392157 | 0.018 | AP-42 Table 1.4-2 |
| Total HAPs | -- | -- | 0.006 | -- |
| 2-Methylnaphthalene | 2.4E-05 | 2.4E-08 | 7.7E-08 | AP-42 Table 1.4-3 |
| 3-Methylchloranthrene | 1.8E-06 | 1.8E-09 | 5.8E-09 | AP-42 Table 1.4-3 |
| 7,12-Dimethylbenz(a)anthracene | 1.6E-05 | 1.6E-08 | 5.2E-08 | AP-42 Table 1.4-3 |
| Acenaphthene | 1.8E-06 | 1.8E-09 | 5.8E-09 | AP-42 Table 1.4-3 |
| Acenaphthlyene | 1.8E-06 | 1.8E-09 | 5.8E-09 | AP-42 Table 1.4-3 |
| Anthracene | 2.4E-06 | 2.4E-09 | 7.7E-09 | AP-42 Table 1.4-3 |
| Benz(a)anthracene | 1.8E-06 | 1.8E-09 | 5.8E-09 | AP-42 Table 1.4-3 |
| Benzene | 2.1E-03 | 2.1E-06 | 6.8E-06 | AP-42 Table 1.4-3 |
| Benzo(a)pyrene | 1.2E-06 | 1.2E-09 | 3.9E-09 | AP-42 Table 1.4-3 |
| Benzo(b)fluoranthene | 1.8E-06 | 1.8E-09 | 5.8E-09 | AP-42 Table 1.4-3 |
| Benzo(g,h,i)perylene | 1.2E-06 | 1.2E-09 | 3.9E-09 | AP-42 Table 1.4-3 |
| Benzo(k)fluoranthene | 1.8E-06 | 1.8E-09 | 5.8E-09 | AP-42 Table 1.4-3 |
| Chrysene | 1.8E-06 | 1.8E-09 | 5.8E-09 | AP-42 Table 1.4-3 |
| Dibenzo(a,h)anthracene | 1.2E-06 | 1.2E-09 | 3.9E-09 | AP-42 Table 1.4-3 |
| Dichlorobenzene | 1.2E-03 | 1.2E-06 | 3.9E-06 | AP-42 Table 1.4-3 |
| Fluoranthene | 3.0E-06 | 2.9E-09 | 9.7E-09 | AP-42 Table 1.4-3 |
| Fluorene | 2.8E-06 | 2.7E-09 | 9.0E-09 | AP-42 Table 1.4-3 |
| Formaldehyde | 7.5E-02 | 7.4E-05 | 2.4E-04 | AP-42 Table 1.4-3 |
| Hexane | 1.8E+00 | 1.8E-03 | 5.8E-03 | AP-42 Table 1.4-3 |
| Indeno(1,2,3-cd)pyrene | 1.8E-06 | 1.8E-09 | 5.8E-09 | AP-42 Table 1.4-3 |
| Naphthalene | 6.1E-04 | 6.0E-07 | 2.0E-06 | AP-42 Table 1.4-3 |
| Phenanthrene | 1.7E-05 | 1.7E-08 | 5.5E-08 | AP-42 Table 1.4-3 |
| Pyrene | 5.0E-06 | 4.9E-09 | 1.6E-08 | AP-42 Table 1.4-3 |
| Toluene | 3.4E-03 | 3.3E-06 | 1.1E-05 | AP-42 Table 1.4-3 |
| Arsenic | 2.0E-04 | 2.0E-07 | 6.4E-07 | AP-42 Table 1.4-4 |
| Beryllium | 1.2E-05 | 1.2E-08 | 3.9E-08 | AP-42 Table 1.4-4 |
| Cadmium | 1.1E-03 | 1.1E-06 | 3.5E-06 | AP-42 Table 1.4-4 |
| Chromium | 1.4E-03 | 1.4E-06 | 4.5E-06 | AP-42 Table 1.4-4 |
| Cobalt | 8.4E-05 | 8.2E-08 | 2.7E-07 | AP-42 Table 1.4-4 |
| Manganese | 3.8E-04 | 3.7E-07 | 1.2E-06 | AP-42 Table 1.4-4 |
| Mercury | 2.6E-04 | 2.5E-07 | 8.4E-07 | AP-42 Table 1.4-4 |
| Nickel | 2.1E-03 | 2.1E-06 | 6.8E-06 | AP-42 Table 1.4-4 |
| Selenium | 2.4E-05 | 2.4E-08 | 7.7E-08 | AP-42 Table 1.4-4 |

SM ENERGY
Spearhead Federal 14-7H
FUGITIVE EMISSIONS

| Component Source Counts | | | | | |
|---|---|---|---|---|---|
| Equipment Type | Storage Tank | Wellhead | Separator | Heater-treater | Header |
| | | | | | |
| Number of units | 8 | 1 | 1 | 1 | 1 |
| Valves | 6 | 5 | 6 | 8 | 5 |
| Flanges | 4 | 10 | 12 | 12 | 10 |
| Connectors | 20 | 4 | 10 | 20 | 4 |
| Open-ended lines | 2 | 0 | 0 | 0 | 0 |
| Other components | 2 | 1 | 0 | 0 | 0 |

| | | Emissions | | | |
|---|---|---|---|---|---|
| Total Component Count | | Hydrocarbon EF (lb/component-day) | TPY HC | HC VOC Wt. Fraction | TPY VOCs |
| Valves | 72 | 0.13 | 1.71 | 1 | 1.71 |
| Flanges | 76 | 0.0058 | 0.08 | 1 | 0.08 |
| Connectors | 198 | 0.011 | 0.40 | 1 | 0.40 |
| Open-ended lines | 16 | 0.074 | 0.22 | 1 | 0.22 |
| Other components | 17 | 0.4 | 1.24 | 1 | 1.24 |
| Total | 379 | | 3.64 | | 3.64 |

Total HCs = 3.64 TPY
Total VOC's = 3.64 TPY
Total VOC's = 0.83 lb/hr
Total HAPs = 0.30 TPY
Total HAPs = 0.07 lb/hr

- Component counts were derived from Table W-1C of Subpart W (Oil and Natural Gas Systems) of 40 CFR Part 98 for Western U.S. oil production equipment for wellheads and heater treater. Tank components are based on engineering estimates.
- Emission Factors (in lb/component-day) from Wyoming Air Quality Division Oil and Gas Permitting Guidance, 2007
- Light Oil VOC Weight fraction assumed to be 1.0 to be conservative
- To be conservative, all Speciated Fugitive Emission Factors (Wt Fractions) from light crude - Wyoming Air Quality Division Oil and Gas Permitting Guidance, 2007 (HAP Fraction of Hydrocarbon Emissions 0.2585)
- Total HAPs calculated by multiplying Total HCs in TPY by weight fraction HAPs

# SM ENERGY
# Spearhead Federal 14-7H
# LOADING EMISSIONS

## Truck Loading Emission Methodology

$$L_L = 12.46 \times \frac{SPM}{T}$$

Where:

$L_L$ = loading loss (lb/1,000 gallon liquid loaded)
S = saturation factor (AP-42 Table 5.2-1)
P = true vapor pressure of liquid loaded (psia), (from AP-42 Table 7.1-2)
M = molecular weight of vapor (Table 7.1-2)
T = Temperature of liquid loaded (°R = 460 + °F)

| Variables | | Source |
|---|---|---|
| S | 0.6 | AP-42 Table 5.2-1 (Submerged loading: dedicated normal service) |
| P (psia) | 1.9 | AP-42 Table 7.1-2 (Crude Oil RVP 5 at 40F) |
| M (lb/lbmole) | 50 | AP-42 Table 7.1-2 (Crude Oil RVP 5) |
| T (°R) | 520 | Annual average temperature (60°F) |
| $L_L$ (lb/1,000 gal) | 1.366 | -- |
| Loading (bbl/day) | 235 | Total production from well (including a decline factor of 40% to account for the decrease in production during the first year) |
| Loading (bbl/yr) | 85,775 | -- |
| HAP Fraction (wt.) | 0.08 | Low Pressure Oil Sample |

## Truck Loading Emission Estimates

$$\text{VOC (TPY)} = \frac{\text{Annual Production (bbl)}}{\text{yr}} \times \frac{42\text{ (gal)}}{\text{bbl}} \times \frac{1}{1000} \times \frac{L_L\text{ (lb)}}{\text{1,000 gallon}} \times \frac{\text{1 (ton)}}{\text{2,000 (lb)}} = \mathbf{2.46}\ \textbf{Ton VOC/yr}$$

$$\text{VOC (lb/hr)} = \frac{\text{VOC (ton)}}{\text{yr}} \times \frac{\text{2,000 (lb)}}{\text{1 (ton)}} \times \frac{\text{1 yr}}{\text{1,460 hrs}} = \mathbf{3.37}\ \textbf{lb VOC/hr}$$

$$\text{HAP (TPY)} = \frac{\text{VOC (ton)}}{\text{yr}} \times \text{HAP Fraction} = \mathbf{0.20}\ \textbf{Ton HAP/yr}$$

$$\text{HAP (lb/hr)} = \frac{\text{VOC (lb)}}{\text{hr}} \times \text{HAP Fraction} = \mathbf{0.28}\ \textbf{lb HAP/hr}$$

**SM ENERGY**
**Spearhead Federal 14-7H**
**CONTROLLED TANK EMISSIONS**

| CO and NOx Emissions From Combustion of Tank Vapors | | | | |
|---|---|---|---|---|
| Compound | Emission Factor (lb/MMBtu) | Throughput MMBtu/yr | Controlled Emissions (TPY) | Emission Factor Source |
| CO | 0.37 | 17,985 | 3.327 | AP-42 Table 13.5-1 |
| $NO_x$ | 0.14 | 17,985 | 1.259 | AP-42 Table 13.5-1 |

HC Vapor emissions (MSCFD) = 18.5100
Gas Heat Content (Btu/SCF) = 2,661.99
Annual heat throughput (Btu/yr) = 17,984,803,739
* Both the throughput and heat content are from the E&P TANKS results - attached.

| VOC and HAPs Emissions From Combustion of Tank Vapors | | | | |
|---|---|---|---|---|
| Compound | Throughput (TPY) | Burner Control Efficiency (%) | Controlled Emissions (TPY) | Emission Factor Source |
| VOC | 372.18 | 98 | 7.444 | WY Oil and Gas Guidance -2010 |
| HAPs | 7.72 | 98 | 0.154 | WY Oil and Gas Guidance -2010 |

Emissions are based on 98% control efficiency.
Production values put in E&P TANKS is incorporating a decline curve of 0.6 to account for the decrease in production during the first year

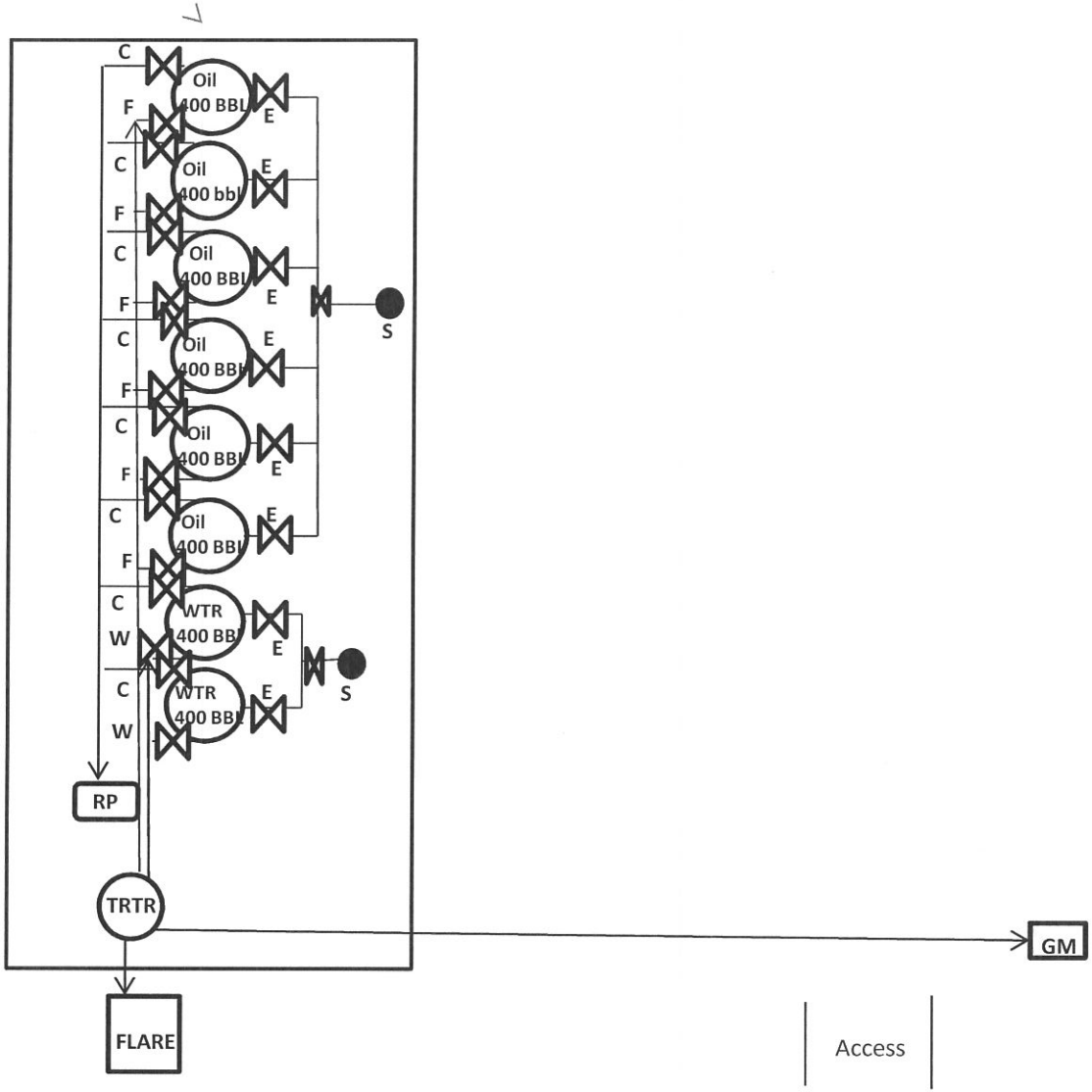
SM ENERGY CO
SITE SECURITY DIAGRAM:
WELL NO: SPEARHEAD FED 14-7H
FIELD NAME: SPEARHEAD RANCH
LOCATION: NWSW Sec. 7, T39N, R74W
COUNTY: Carbon County, WY
BLM # WYW126951

SITE FACILITY PLAN LOCATED AT:
SM ENERGY CO
550 N 31ST ST, SUITE 500
BILLINGS, MT 59103

NOT TO SCALE

| VALVE SEALING DETAIL | PRODUCTION OR NORMAL OPERATIONS | RECYCLING | SALES |
|---|---|---|---|
| C=RECYCLING | O/C | O | SC |
| E=EQUALIZER | O/C | O/C | SC |
| F=PRODUCTION | O | O/C | SC |
| S = SALES | SC | SC | O |

WHERE: O – OPEN, SO – SEALED OPEN,
C – CLOSED, SC – SEALED CLOSED,
O/C – OPEN OR SEALED




Access

RG 1/23/15

N

**********
******
*  Project Setup Information
*
**********
******

Project File : Untitled.Ept
Flowsheet Selection : Oil Tank with Separator
Calculation Method : RVP Distillation
Control Efficiency : 98.0%
Known Separator Stream : Low Pressure Oil
Entering Air Composition : No

Filed Name : SM PRB Spearhead Fed
Well Name : Spearhead Fed 14-7
Date : 2015.05.01

**********
******
*  Data Input
*
**********
******

Separator Pressure : 30.00[psig]
Separator Temperature : 80.00[F]
Ambient Pressure : 14.70[psia]
Ambient Temperature : 70.00[F]
C10+ SG : 0.7475
C10+ MW : 163.188

-- Low Pressure Oil

| No. | Component | mol % |
|---|---|---|
| 1 | H2S | 0.0000 |
| 2 | O2 | 0.0000 |
| 3 | CO2 | 0.0504 |
| 4 | N2 | 0.0000 |
| 5 | C1 | 0.3732 |
| 6 | C2 | 1.1800 |
| 7 | C3 | 5.2001 |
| 8 | i-C4 | 1.5265 |
| 9 | n-C4 | 5.6463 |
| 10 | i-C5 | 3.7008 |
| 11 | n-C5 | 4.7571 |
| 12 | C6 | 4.5526 |
| 13 | C7 | 17.5306 |
| 14 | C8 | 8.8237 |
| 15 | C9 | 8.0407 |
| 16 | C10+ | 28.9610 |
| 17 | Benzene | 0.3527 |
| 18 | Toluene | 1.5732 |
| 19 | E-Benzene | 0.3364 |
| 20 | Xylenes | 2.1105 |
| 21 | n-C6 | 4.3537 |
| 22 | 224Trimethylp | 0.9211 |

-- Sales Oil

Production Rate : 235[bbl/day]
Days of Annual Operation : 365 [days/year]

API Gravity : 39.7
Reid Vapor Pressure : 8.00[psia]

**********

* Calculation Results *

**********

-- Emission Summary

| Item | Uncontrolled [ton/yr] | Uncontrolled [lb/hr] | Controlled [ton/yr] | Controlled [lb/hr] |
|---|---|---|---|---|
| Total HAPs | 7.720 | 1.763 | 0.154 | 0.035 |



E&P TANK

| | | | | |
|---|---|---|---|---|
| Total HC | 418.129 | 95.463 | 8.363 | 1.909 |
| VOCs, C2+ | 411.474 | 93.944 | 8.229 | 1.879 |
| VOCs, C3+ | 372.176 | 84.972 | 7.444 | 1.699 |

Uncontrolled Recovery Info.

| | | |
|---|---|---|
| Vapor | 18.5100 | [MSCFD] |
| HC Vapor | 18.4000 | [MSCFD] |
| GOR | 78.77 | [SCF/bbl] |

-- Emission Composition

| No | Component | Uncontrolled [ton/yr] | Uncontrolled [lb/hr] | Controlled [ton/yr] | Controlled [lb/hr] |
|---|---|---|---|---|---|
| 1 | H2S | 0.000 | 0.000 | 0.000 | 0.000 |
| 2 | O2 | 0.000 | 0.000 | 0.000 | 0.000 |
| 3 | CO2 | 2.465 | 0.563 | 2.465 | 0.563 |
| 4 | N2 | 0.000 | 0.000 | 0.000 | 0.000 |
| 5 | C1 | 6.655 | 1.519 | 0.133 | 0.030 |
| 6 | C2 | 39.299 | 8.972 | 0.786 | 0.179 |
| 7 | C3 | 195.526 | 44.641 | 3.911 | 0.893 |
| 8 | i-C4 | 29.482 | 6.731 | 0.590 | 0.135 |
| 9 | n-C4 | 74.122 | 16.923 | 1.482 | 0.338 |
| 10 | i-C5 | 22.199 | 5.068 | 0.444 | 0.101 |
| 11 | n-C5 | 21.083 | 4.813 | 0.422 | 0.096 |
| 12 | C6 | 7.637 | 1.744 | 0.153 | 0.035 |
| 13 | C7 | 11.262 | 2.571 | 0.225 | 0.051 |
| 14 | C8 | 2.041 | 0.466 | 0.041 | 0.009 |
| 15 | C9 | 0.741 | 0.169 | 0.015 | 0.003 |
| 16 | C10+ | 0.362 | 0.083 | 0.007 | 0.002 |
| 17 | Benzene | 0.409 | 0.093 | 0.008 | 0.002 |
| 18 | Toluene | 0.602 | 0.137 | 0.012 | 0.003 |
| 19 | E-Benzene | 0.049 | 0.011 | 0.001 | 0.000 |
| 20 | Xylenes | 0.265 | 0.061 | 0.005 | 0.001 |
| 21 | n-C6 | 5.846 | 1.335 | 0.117 | 0.027 |
| 22 | 224Trimethylp | 0.549 | 0.125 | 0.011 | 0.003 |
| | Total | 420.594 | 96.026 | 8.412 | 1.921 |

-- Stream Data

| No. | Component | MW | LP Oil | Flash Oil | Sale Oil | Flash Gas | W&S Gas | Total Emissions |
|---|---|---|---|---|---|---|---|---|
| | | | mol % | mol % | mol % | mol % | mol % | mol % |
| 1 | H2S | 34.80 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| 0.0000 | | | | | | |
| 2 O2 | 32.00 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| 0.0000 | | | | | | |
| 3 CO2 | 44.01 | 0.0504 | 0.0207 | 0.0000 | 1.2709 | 0.3581 |
| 0.6283 | | | | | | |
| 4 N2 | 28.01 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| 0.0000 | | | | | | |
| 5 C1 | 16.04 | 0.3732 | 0.0730 | 0.0000 | 12.7188 | 1.2619 |
| 4.6530 | | | | | | |
| 6 C2 | 30.07 | 1.1800 | 0.6932 | 0.0046 | 21.2005 | 11.9094 |
| 14.6594 | | | | | | |
| 7 C3 | 44.10 | 5.2001 | 4.4071 | 1.3167 | 37.8297 | 54.7414 |
| 49.7358 | | | | | | |
| 8 i-C4 | 58.12 | 1.5265 | 1.4479 | 1.1636 | 4.7638 | 6.0788 |
| 5.6896 | | | | | | |
| 9 n-C4 | 58.12 | 5.6463 | 5.4779 | 4.8918 | 12.5911 | 15.0244 |
| 14.3042 | | | | | | |
| 10 i-C5 | 72.15 | 3.7008 | 3.7129 | 3.7229 | 3.2160 | 3.5500 |
| 3.4512 | | | | | | |
| 11 n-C5 | 72.15 | 4.7571 | 4.7987 | 4.8866 | 3.0650 | 3.3671 |
| 3.2777 | | | | | | |
| 12 C6 | 86.16 | 4.5526 | 4.6406 | 4.8612 | 0.9540 | 1.0475 |
| 1.0198 | | | | | | |
| 13 C7 | 100.20 | 17.5306 | 17.9293 | 18.9476 | 1.2080 | 1.3419 |
| 1.3023 | | | | | | |
| 14 C8 | 114.23 | 8.8237 | 9.0345 | 9.5761 | 0.1891 | 0.2135 |
| 0.2063 | | | | | | |
| 15 C9 | 128.28 | 8.0407 | 8.2356 | 8.7368 | 0.0587 | 0.0714 |
| 0.0676 | | | | | | |
| 16 C10+ | 163.19 | 28.9610 | 29.6676 | 31.4875 | 0.0218 | 0.0263 |
| 0.0249 | | | | | | |
| 17 Benzene | 78.11 | 0.3527 | 0.3600 | 0.3784 | 0.0547 | 0.0603 |
| 0.0587 | | | | | | |
| 18 Toluene | 92.13 | 1.5732 | 1.6100 | 1.7042 | 0.0675 | 0.0756 |
| 0.0732 | | | | | | |
| 19 E-Benzene | 106.17 | 0.3364 | 0.3445 | 0.3653 | 0.0047 | 0.0053 |
| 0.0051 | | | | | | |
| 20 Xylenes | 106.17 | 2.1105 | 2.1614 | 2.2923 | 0.0255 | 0.0291 |
| 0.0280 | | | | | | |
| 21 n-C6 | 86.18 | 4.3537 | 4.4427 | 4.6675 | 0.7101 | 0.7823 |
| 0.7609 | | | | | | |
| 22 224Trimethylp | 114.24 | 0.9211 | 0.9424 | 0.9968 | 0.0500 | 0.0555 |
| 0.0539 | | | | | | |
| | | | | | | |
| MW | | 109.86 | 111.48 | 115.32 | 43.37 | 48.78 |
| 47.18 | | | | | | |
| Stream Mole Ratio | | 1.0000 | 0.9763 | 0.9198 | 0.0237 | 0.0565 |
| 0.0802 | | | | | | |
| Heating Value | [BTU/SCF] | | | | 2442.23 | 2754.38 |
| 2661.99 | | | | | | |
| Gas Gravity | [Gas/Air] | | | | 1.50 | 1.68 |
| 1.63 | | | | | | |
| Bubble Pt. @ 100F | [psia] | 35.32 | 21.66 | 8.92 | | |
| RVP @ 100F | [psia] | 19.80 | 15.37 | 8.00 | | |



| | | | | | | |
|---|---|---|---|---|---|---|
| Spec. Gravity @ 100F | | 0.675 | 0.676 | 0.680 | | |

# *QUESTAR APPLIED TECHNOLOGY*

**1210 D. Street, Rock Springs, Wyoming 82901**

**(307) 352-7292**

| | | | | |
|---|---|---|---|---|
| LIMS ID: | N/A | | Description: | Spearhead 14-7 |
| Analysis Date/Time: | 4/7/2015 | 8:07 AM | Field: | Spearhead Rch |
| Analyst Initials: | PRP | | ML#: | SM Energy |
| Sample Temperature: | 80 | | GC Method: | Quesliql GPA 2186 |
| Sample Pressure: | 30 | | Data File: | QPC32.D |
| Date Sampled: | 4/1/2015 | | Instrument ID: | 1 |

| Component | Mol% | Wt% | LV% |
|---|---|---|---|
| Methane | 0.3732 | 0.0543 | 0.1289 |
| Ethane | 1.1800 | 0.3220 | 0.6434 |
| Propane | 5.2001 | 2.0809 | 2.9206 |
| Isobutane | 1.5265 | 0.8052 | 1.0184 |
| n-Butane | 5.6463 | 2.9782 | 3.6290 |
| Neopentane | 0.1402 | 0.0918 | 0.1096 |
| Isopentane | 3.5606 | 2.3313 | 2.6547 |
| n-Pentane | 4.7571 | 3.1147 | 3.5155 |
| 2,2-Dimethylbutane | 0.0534 | 0.0417 | 0.0454 |
| 2,3-Dimethylbutane | 0.7201 | 0.5631 | 0.6017 |
| 2-Methylpentane | 2.4144 | 1.8881 | 2.0431 |
| 3-Methylpentane | 1.3647 | 1.0672 | 1.1355 |
| n-Hexane | 4.3637 | 3.4126 | 3.6584 |
| Heptanes | 17.8833 | 15.7416 | 15.3257 |
| Octanes | 11.3180 | 11.3859 | 11.0154 |
| Nonanes | 10.4876 | 11.7160 | 11.1593 |
| Decanes plus | 28.9610 | 42.3847 | 40.3770 |
| Nitrogen | 0.0000 | 0.0000 | 0.0000 |
| Carbon Dioxide | 0.0504 | 0.0201 | 0.0175 |
| Total | 100.0000 | 100.0000 | 100.0000 |

| **Global Properties** | | **Units** |
|---|---|---|
| Avg Molecular Weight | 110.1917 | gm/mole |
| Pseudocritical Pressure | 414.06 | psia |
| Pseudocritical Temperature | 529.52 | degF |
| Specific Gravity | 0.71192 | gm/ml |
| Liquid Density | 5.9352 | lb/gal |
| Liquid Density | 249.28 | lb/bbl |
| Specific Gravity | 2.7816 | air=1 |
| SCF/bbl | 860.94 | SCF/bbl |
| SCF/gal | 20.4986 | SCF/gal |
| MCF/gal | 0.0205 | MCF/gal |
| gal/MCF | 48.809 | gal/MCF |
| Net Heating Value | 5495.1 | BTU/SCF at 60°F |
| Net Heating Value | 18976.9 | BTU/lb at 60°F |
| Gross Heating Value | 5582.4 | BTU/SCF at 60°F |
| Gross Heating Value | 20439.4 | BTU/lb at 60°F |
| Gross Heating Value | 122388.6 | BTU/gal at 60°F |
| API Gravity | 67.3 | |
| MON | 50.9 | |
| RON | 52.2 | |
| RVP | 45.136 | psia |

| Component | Mol% | Wt% | LV% |
|---|---|---|---|
| Benzene | 0.3527 | 0.2500 | 0.2012 |
| Toluene | 1.5732 | 1.3155 | 1.0740 |
| Ethylbenzene | 0.3364 | 0.3241 | 0.2646 |
| M&P Xylene | 1.6375 | 1.5777 | 1.2927 |
| O-Xylene | 0.4730 | 0.4557 | 0.3667 |
| 2,2,4-Trimethylpentane | 0.9211 | 0.9548 | 0.9438 |

Data File: Spearhead 14- HAPS 8.2904 Page #2

GRI E&P TANK INFORMATION

| Component | Mol% | Wt% | LV% |
|---|---|---|---|
| H2S | 0.0000 | 0.0000 | 0.0000 |
| O2 | 0.0000 | 0.0000 | 0.0000 |
| CO2 | 0.0504 | 0.0201 | 0.0175 |
| N2 | 0.0000 | 0.0000 | 0.0000 |
| C1 | 0.3732 | 0.0543 | 0.1289 |
| C2 | 1.1800 | 0.3220 | 0.6434 |
| C3 | 5.2001 | 2.0809 | 2.9206 |
| IC4 | 1.5265 | 0.8052 | 1.0184 |
| NC4 | 5.6463 | 2.9782 | 3.6290 |
| IC5 | 3.7008 | 2.4231 | 2.7643 |
| NC5 | 4.7571 | 3.1147 | 3.5155 |
| Hexanes | 4.5526 | 3.5601 | 3.8257 |
| Heptanes | 17.5306 | 15.4916 | 15.1245 |
| Octanes | 8.8237 | 9.1156 | 8.9976 |
| Nonanes | 8.0407 | 9.3585 | 9.2353 |
| Benzene | 0.3527 | 0.2500 | 0.2012 |
| Toluene | 1.5732 | 1.3155 | 1.0740 |
| E-Benzene | 0.3364 | 0.3241 | 0.2646 |
| Xylene | 2.1105 | 2.0334 | 1.6594 |
| n-C6 | 4.3637 | 3.4126 | 3.6584 |
| 2,2,4-Trimethylpentane | 0.9211 | 0.9548 | 0.9438 |
| C10 Plus | | | |
| C10 Mole % | 28.9610 | 42.3847 | 40.3770 |
| Molecular Wt. | 163.1878 | | |
| Specific Gravity | 0.7475 | | |
| Total | 100.00 | 100.00 | 100.00 |